CLAIMS:

1. An optical data storage system for recording and/or reading, using a radiation beam having a wavelength λ, focused onto a data storage layer of an optical data storage medium, said system comprising:
- the medium, having a cover layer that is transparent to the focused radiation beam, said cover layer having a thickness h smaller than 5 μm,
- an optical head, including an objective having a numerical aperture NA, said objective including a solid immersion lens that is adapted for being present at a free working distance of smaller than λ/10 from an outermost surface of said medium and arranged on the cover layer side of said optical data storage medium, and from which solid immersion lens the focused radiation beam is coupled by evanescent wave coupling into the cover layer of the optical data storage medium during recording/reading,

characterized in that,

the thickness variation Δh of the cover layer over the whole medium is smaller than 50 nm.

2. An optical data storage system as claimed in claim 1, wherein Δh is smaller than 20 nm.

3. An optical data storage system as claimed in any one of claims 1 or 2, wherein the optical head comprises:
- a first adjustable optical element corresponding to the solid immersion lens
- means for axially moving the first optical element in order to keep the distance between cover layer and solid immersion lens dynamically constant,
- a second adjustable optical element,
- means for adjusting the second optical element in order to change, with a low bandwidth, the position of the focal point of the focused radiation beam relative to an exit surface of the solid immersion lens.

4. An optical data storage system as claimed in claim 3, wherein the second optical element is present in the objective.

5. An optical data storage system as claimed in claim 3, wherein the second optical element is present outside the objective.

6. An optical data storage system as claimed in claims 4 or 5, wherein the second optical element is axially movable with respect to the first optical element.

7. An optical data storage system as claimed in any one of claims 4 or 5, wherein the second optical element has a focal length which is electrically adjustable, e.g. by electrowetting or electrically influencing the orientation of liquid crystal material.

8. A method of optical recording and/or reading with a system as claimed in claim 3, wherein:
- the free working distance is kept constant by using a first, high bandwidth servo loop based on a gap error signal, e.g. derived from the amount of evanescent coupling between the solid immersion lens and the cover layer,
- the first optical element is actuated based on the first servo loop,
- a second, low bandwidth servo loop is active based on a focus control signal derived from the modulation depth of a modulated signal recorded in the data storage layer,
- the second optical element is adjusted based on the second servo loop in order to retrieve an optimal modulated signal.

9. A method as claimed in claim 8, wherein an oscillation is superimposed on the adjustment of the second optical element and wherein the focus control signal additionally is derived from the oscillation direction of the second optical element.

10. A method as claimed in claim 8, wherein the modulated signal is recorded as recorded data in the optical data storage medium.

11. A method as claimed in claim 8, wherein the modulated signal is recorded in a lead-in area of the optical data storage medium.

12. A method as claimed in claim 8, wherein the modulated signal is recorded as a wobbled track of the optical data storage medium.